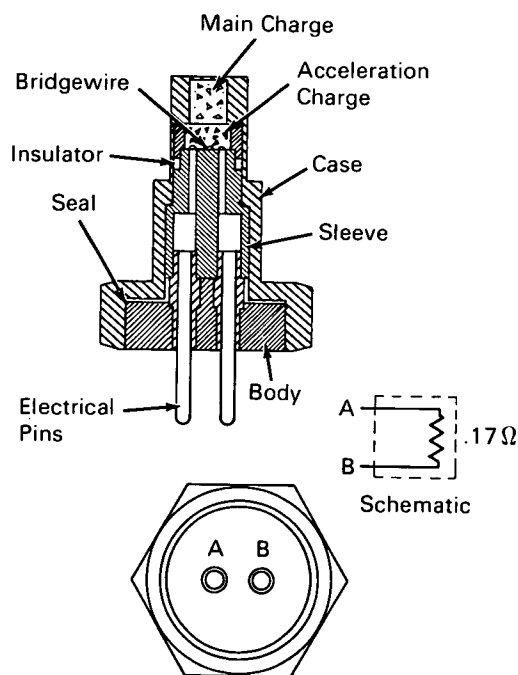


NASA TECH BRIEF



NASA Tech Briefs are issued to summarize specific innovations derived from the U.S. space program, to encourage their commercial application. Copies are available to the public at 15 cents each from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

Exploding Bridgewire Detonator Simulator



Internal Construction of the EBW Detonator Simulator

Tests of the EBW (exploding bridgewire) detonator were conducted in which an electric detonator simulator was used. New data on the physical characteristics and explosive reactions of typical EBW detonators for increasing amperages were obtained. Basic data such as bridgewire action, explosive output, and test circuitry were also generated.

One hundred detonator simulators with the same critical design characteristics as the EBW detonator, except for the spark gap, were used in a series of tests. No-fire tests were conducted on the simulators using one-ampere, one-watt, or increased amperage (5 to

100 amperes) as the test stimuli. All units withstood their respective stimuli for 5 minutes without firing.

When a high-voltage, high-energy pulse is applied to a small wire resistance element, the wire explodes with a rapid release of large amounts of energy. This energy initiates a train of chemical explosives in the EBW detonator. The final component of the train (output charge) is a small charge of high explosives which produces a high-velocity shock wave that can detonate another explosive device. Thus, the EBW detonator can initiate, on command, the explosive components of a rocket stage.

The test unit (see figure) is configured on one end with two electrical pins and has a hexagonal center section and a cylindrical end case that contains the explosive train. A series electric circuit consisting of a wire-resistance element, or bridgewire, is contained in the test unit.

The detonator simulator has bridgewire resistance, pin spacing, explosive train, and heat sink properties identical to those of the EBW detonator and was designed specifically for these tests, since actual EBW detonators could not be used. The functional characteristics of the protective spark gap in the detonator, which would have blocked the application of current to the bridgewire, precluded the use of actual EBW detonators in the tests.

The tests described in the report mentioned below demonstrated that the EBW detonator simulator will not fire as a result of the application of one ampere for 5 minutes and/or the application of a direct-current power of one watt for 5 minutes. The tests also showed that the EBW detonator will not fire if the protective gap fails and the firing stimulus described is inadvertently applied.

(continued overleaf)

Notes:

1. Additional information is available in "One-Ampere, One-Watt, No-Fire Demonstration of the Electric Detonator, Exploding Bridgewire Type, Douglas Specification Control No. 7865742-1, Model No. Saturn S-IV," Douglas Report SM-46868, September 1965.
2. The information may be useful to those using explosive and explosive safety devices.
3. Requests for further information may be directed to:
Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference B69-10782

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: R.R. Sullivan and R.C. Tarpley of
Douglas Aircraft Company, Inc.
under contract to
Marshall Space Flight Center
(MFS-02191)